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EXAMINER	
FORD, JOHN K	

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3784	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/698,179	KENNY ET AL.	
	Examiner	Art Unit	
	John K. Ford	3784	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 April 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,8-27,29-33,35-130 and 132* is/are pending in the application.

4a) Of the above claim(s) *9,11,15,18,20-27,33,35-37,39,42,43 and 45-127* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,8,10,12-14,16,17,19,29-32,38,40,41,44,128-130 and 132* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/18/11, 2/2/11 and 4/26/11*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Applicant's response of March 10, 2011 (entered pursuant to an RCE filed April 7, 2011) has been carefully considered. Claims 1 and 132 have been amended. The remainder of the claims have not been amended. Most significantly claim 1 has been amended so that the fluid flows **from** the first of the one or more fingers **to** the second of one or more fingers.

Applicant has elected (now shown in Figure 21) a species of Figures 3A-3B, wherein, instead of microchannel walls 110 as shown in Figure 3B, applicant now has, in Figure 21, replaced those microchannel walls 110, with a porous structure 110' that can be one of sintered metal or silicon foam. Among these two alternatives of material, applicant elected sintered metal.

An action on the merits follows on claims 1, 8, 10, 12-14, 16, 17, 19, 29-32, 38, 40, 41, 44, 128-130 and 132. The remainder of the claims are designated as non-elected or have been canceled.

Applicant has previously concurred with the examiner's statement: "As the examiner understands it, claim 1 is directed to the heat exchanger, per se, while claim 128 is directed to the heat exchanger of claim 1 in combination with a heat source including 'at least one interface hot spot region'".

Applicant's remarks with respect to the allowability of the claims however are not convincing and they are addressed in the rejections that follow.

The request to withdraw the finality (March 10, 2011 amendment, page 16) of the previous office action (mailed January 13, 2011) is deemed moot in light of the filing of the RCE on April 7, 2011. As to the merits of applicant's arguments, they are not convincing because they state purported facts about the previous office action that are not supported by the record. Previously, applicant's comments to the contrary notwithstanding, the first of the one or more fingers only had to branch from the inlet channel **and** the second of one or more fingers only had to branch from the inlet channel. There was no limitation in the claims that the fluid flow **from** the first of the one or more fingers **to** the second of one or more fingers as now claimed in the amendment of March 10, 2011.

Counsel has explained, previously, that the new wording that has replaced the word "set" is descriptive of the elected species. Specifically, on page 16 of the 11/9/10 response, counsel explains that a first of one or more fingers can be finger 118A, extending in the "x" direction in Figures 3B and 21 and a second of one or more fingers can be 118B and 118C, extending in the "y" direction in Figures 3B and 21. Those two directions ("x" and "y") are obviously nonparallel. Thus, with regard to claim 1, at least a portion of finger 118A is nonparallel to a portion of fingers 118B and/or 118C. The new limitation in claim 1 that the fluid flow **from** the first of the one or more fingers **to** the

second of one or more fingers as now claimed in the amendment of March 10, 2011 appears to conflict with applicant's prior statements on page 16 of the 11/9/10 response because first finger 118A does not conduct fluid flow to second fingers 118B and/or 118C. Apparently applicant, through counsel, is changing his explanation of how the device works. Applicant is required to state which "fingers" in the original disclosure are being claimed in claim 1 (i.e. which of applicant's disclosed "first fingers" feed fluid **from** themselves **to** "second fingers" as argued in applicant's remarks).

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 132 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The recitation in claim 132 that at least one inlet port, inlet channel and the first of one or more fingers, the second of one or more fingers, or both lie in a common plane appears to be mis-descriptive. All of these structures are three dimensional and hence, by definition cannot lie in a common plane (a plane being two dimensional). By disclosure, member 106 has a top planar surface 130 and a bottom planar surface 132 as it is shown. There are no limits set on how far apart these two planar surfaces are from one another and hence no limits set on exactly how planar the at least one inlet

port, inlet channel and the first of one or more fingers, the second of one or more fingers, or both are with respect to one another. The limitation "lie in a common plane" is therefore indefinite.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 8, 10, 12, 13, 14, 17, 19, 32, 38, 40 and 128-130 and 132 are rejected under 35 U.S.C. 103(a) as obvious over the combined teachings of Gruber et al (USP 5,388,635) and Anderson et al (USP 5,761,037).

Gruber, assigned to IBM, shows in Figures 3, 4, 8A and 8B a system for cooling a heat source. An inlet port (analogous to port 108 in applicant's Figure 3b) is shown in Figure 8A at the very top of a cylindrical inlet channel that extends downwardly in Figure 8A. Collectively, the aforementioned inlet port and cylindrical channel below it (hereinafter "inlet port/channel 28") are designated by reference numeral 28 in Gruber. The cylindrical inlet channel directs fluid from the aforementioned inlet port to a first of one or more fingers (the portion of duct segments 30 that extend radially from inlet port/channel 28) that, in turn, feed fluid to a second of one of more fingers (the portion

of duct segments 30 that are connected to and feed fluid to each of the supply channels 32).

These first fingers feed fluid to second fingers that, in turn, feed fluid to an intermediate layer (plate 16) that has a plurality of holes extending therethrough. A heat exchanger layer 14 includes micro-fins 56 defining micro-grooves 58 between them similar to applicant's Figure 3A-3B species. As explained by Gruber, the heat exchanger layer 14 can also be “fin-less”. See col. 8, line 34-43, incorporated here by reference. If the heat exchanger layer 14 is “fin-less” Gruber states that it may have “a texture or structures to promote fluid stirring and heat transfer”. Gruber discusses hot spots in col. 15, lines 1-41, incorporated here by reference.

Anderson, also assigned to IBM, shows a heat source 30 (an integrated circuit “chip”) contacting a conducting portion 104 of a heat exchanger. A heat exchanging layer 103 of sintered copper (a microporous sintered metal according to applicant's own examples in his own disclosure) is shown and may be bonded to conducting portion 104. An inlet port connected to pipe 21 and an outlet port connected to pipe 11 are shown in Figure 4. While no particular region in Anderson's integrated circuit chip is disclosed as being hotter than another, arguably applicant's claim doesn't even claim an integrated circuit chip so the limitation is not given weight absent a claim to the overall combination. Notwithstanding that fact, it is apparent that the “hot spot region” 104 is

cooled far more in the center than right at the edge because of the geometry of the device.

To have combined the teachings of Gruber and Anderson by attaching Anderson's wicking layer 103 to Gruber's heat exchanger "fin-less" layer 14 to promote heat transfer particularly when evaporating fluids would have been obvious to one of ordinary skill in the art. Alternatively, to have used Gruber's fluid distribution system (i.e. everything above sheet 14 in Gruber) in place of the fluid distribution system of Anderson (i.e. everything to the left of sheet 103 in Figures 1 and 2 of Anderson) would have been obvious to one of ordinary skill in the art to advantageously achieve high flows with low pressure drop (a benefit explicitly stated by Gruber).

Regarding claim 10, see the outlet in Figure 4 of Anderson, connected to pipe 11. Also see outlet 46 in Gruber. Regarding claims 12 and 13 fluid inlet and outlet grooves are shown in Gruber. Claim 14, being a method of use limitation in an apparatus claim, is not a limitation on the apparatus itself (for further explanation, see MPEP 2114, incorporated here by reference). Regarding claim 17 there is no overhang shown between the layers in Gruber. Since there is no overhang and applicant's claimed range includes an overhang of "0" (i.e. zero) millimeters, this limitation is met. Regarding claim 32, every porous material by the nature of its formation is formed with irregular pores that inherently vary randomly over the flow path as a consequence of

their random orientation. Regarding claims 38 and 40, see Figure 4 of Anderson wherein the body is at least thermally coupled to the integrated circuit chip.

The argument that Anderson does not have fingers branching out in different directions is similarly unavailing because Anderson was not relied upon to teach this feature.

In the July 9, 2009 amendment, applicant amended the claims (consistent with the modified specification of December 22, 2008) to specify that fluid flows from an inlet port (108) through an inlet channel (116) through a plurality of fingers (118, 120) through a plurality of conduits (105) extending through an intermediate layer (104) to a heat exchange layer (102). Gruber discloses flow through an inlet port/channel, through a first of one or more fingers, a second of one or more second fingers, through a plurality of conduits extending through an intermediate layer to a heat exchange layer.

Claims 1, 8, 10, 12, 13, 14, 17, 19, 32, 38, 40 and 128-130 and 132 are rejected under 35 U.S.C. 103(a) as obvious over the combined teachings of Gruber et al (USP 5,388,635) and Anderson et al (USP 5,761,037) and Chu et al (USP 3,993,123) or Frey et al (USP 5,978,220).

The rejection immediately above is incorporated here by reference. To have made the axis of the longitudinal cylindrical ports/channels 28 and 46 shown in Figures

8A and 8B of Gruber face outwardly in a direction parallel to the cooling surface of the heat exchange layer would have been obvious to one of ordinary skill in the art to advantageously facilitate connection between cold plates, as taught by Chu.

Similarly, to have made the axis of the longitudinal cylindrical ports/channels 28 and 46 shown in Figures 8A and 8B of Gruber face outwardly in a direction parallel to the cooling surface of the heat exchange layer would have been obvious to one of ordinary skill in the art to advantageously facilitate connection between cold plates, as taught by Frey at 5 and 6.

Claims 1, 8, 10, 12, 13, 14, 17, 19, 32, 38, 40, 128-130 and 132 are rejected under 35 U.S.C. 103(a) as obvious over the combined teachings of Gruber/Anderson or Gruber/Anderson/Chu/Frey as applied to claims 1, 8, 10, 12, 13, 14, 17, 19, 32, 38, 40 128-130 and 132 above and further in view of either Hou (USP 5,983,997) or Messina et al (USP 5,239,200).

Hou teaches forming different flow channel structures to provide different cooling rates to different parts of the heat transfer surface. Messina teaches the same thing in regard to the explanation of Figure 5, incorporated here by reference. In view of either of these teachings it would have been obvious to have structured the passageways and flow rates in Gruber/Anderson to concentrate cooling in certain areas of high heat load.

In response to applicant's November 9, 2010 remarks, the examiner's explanation, above, of how the fingers of Gruber branch out in a plurality of directions from the at least one inlet port/channel of Gruber is incorporated here by reference.

Applicant's arguments with respect to Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich all echo the arguments made with respect to Gruber and do not traverse that which Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich were relied upon to teach. Accordingly, applicant is deemed to have conceded that Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich are properly relied upon by the examiner for what they have been relied by the examiner to teach.

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gruber/ Anderson alone or Gruber/Anderson/Chu/Frey alone or in view of Hou or Messina as applied to claim 1 above, and further in view of Herrell (USP 4,758,926).

The thickness of layer 104 is not disclosed in Anderson. Gruber discloses a thickness of 375 micrometers (col. 12, line 59) which is 0.375 mm (within applicant's range of 0.3 to 0.7mm).

In Herrell layer 40 is 25 mils thick. Each mil is 25.4 microns. Layer 40 is therefore 635 microns thick. 635 microns is 0.635 millimeters, within applicant's claimed range. To have made the layer 104 of Anderson .635 millimeters thick (when

used with Gruber's fluid distribution system) as taught by Herrell would have been obvious since it is shown by Herrell to be a dimension that works. Similarly to have made the same layer 0.375 mm as taught by Gruber because it also works would have been obvious to one of ordinary skill in the art.

In response to applicant's November 9, 2010 remarks, the examiner's explanation, above, of how the fingers of Gruber branch out in a plurality of directions from the at least one inlet port/channel of Gruber is incorporated here by reference.

Applicant's arguments with respect to Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich all echo the arguments made with respect to Gruber and do not traverse that which Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich were relied upon to teach. Accordingly, applicant is deemed to have conceded that Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich are properly relied upon by the examiner for what they have been relied by the examiner to teach.

Claims 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gruber/Anderson alone or Gruber/Anderson/Chu/Frey alone or in view of Hou or Messina as applied to claim 1 above, and further in view of Tonkovich (USP 6,680,044).

As disclosed the porosity of the porous microstructure should be such that heat exchange medium flows freely. With respect to claims 29-30 applicant has shown no

criticality whatsoever and the art recognized tradeoff between getting adequate heat transfer and avoiding excessive pressure drop suggests that the variables being claimed are ultimately for the designer to select in any given heat transfer application. To have configured the porous intermediate layer of Anderson with a porosity that is known to provide good fluid flow as taught by Tonkovich in col. 2, lines 50-63, incorporated here by reference (teaching a porosity within applicant's claimed range as well as pore sizes in applicant's claimed range and a channel height with applicant's claimed range), would have been obvious to one of ordinary skill in the art to advantageously obtain extremely even cooling without any temperature gradients.

In response to applicant's November 9, 2010 remarks, the examiner's explanation, above, of how the fingers of Gruber branch out in a plurality of directions from the at least one inlet port/channel of Gruber is incorporated here by reference.

Applicant's arguments with respect to Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich all echo the arguments made with respect to Gruber and do not traverse that which Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich were relied upon to teach. Accordingly, applicant is deemed to have conceded that Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich are properly relied upon by the examiner for what they have been relied by the examiner to teach.

Claims 1, 8, 10, 12, 13, 14, 17, 19, 29, 30, 31, 32, 38, 40, 128-130 and 132 are rejected under 35 U.S.C. 103(a) as obvious over Gruber et al (USP 5,388,635) in view of the Jiang et al article "Thermal-Hydraulic performance of small scale micro-channel and porous-media heat exchangers".

Gruber, assigned to IBM, shows in Figures 3, 4, 8A and 8B a system for cooling a heat source. An inlet port (analogous to port 108 in applicant's Figure 3b) is shown in Figure 8A at the very top of a cylindrical inlet channel that extends downwardly in Figure 8A. Collectively, the aforementioned inlet port and cylindrical channel below it are designated by reference numeral 28 in Gruber. The cylindrical inlet channel directs fluid from the aforementioned inlet port to a first of one or more fingers (the portion of duct segments 30 that extend radially from inlet port/channel 28) that, in turn, feed fluid to a second of one of more fingers (the portion of duct segments 30 that are connected to and feed fluid to each of the supply channels 32).

These first and second one or more fingers feed fluid to channels 32 that, in turn, feed fluid to an intermediate plate 16 that has a plurality of holes extending therethrough. A heat exchanger layer 14 includes micro-fins 56 defining micro-grooves 58 between them similar to applicant's Figure 3A-3B species. As explained by Gruber, the heat exchanger layer 14 can also be "fin-less". See col. 8, line 34-43, incorporated here by reference. If the heat exchanger layer 14 is "fin-less" Gruber states that it may

have “a texture or structures to promote fluid stirring and heat transfer”. Gruber discusses hot spots in col. 15, lines 1-41, incorporated here by reference.

The Jiang article discloses the art recognized equivalence of microchannel structures 56 and 58 of Gruber and porous microstructures as claimed by applicant currently. To have made the microchannel structures 56 and 58 of Gruber of microporous media as taught by the Jaing article would have been obvious to one of ordinary skill in the art. In general the microporous media is advantageous in terms of having better heat transfer than the microchannel structures 56 and 58 of Gruber as would have been obvious to have used for that reason in spite of their somewhat higher pressure drop (as disclosed explicitly in the Jaing article).

Regarding claim 8, the inlet port 28 and outlet port 46 are parallel to a plane. Regarding claim 13, grooves (i.e. long narrow channels) are shown in Gruber channeling fluid from one of the inlet and outlet to the fingers. Claim 14, is satisfied because Gruber does not disclose any boiling or vaporization of the heat exchange fluid. Alternatively claim 14, being a method of use limitation in an apparatus claim is not a limitation on the apparatus itself (for further explanation, see MPEP 2114, incorporated here by reference). Regarding claim 17, in Gruber there is no overhang shown in Figures 13-15. Since there is no overhang and applicant's claimed range includes an overhang of “0” (i.e. zero) millimeters, this limitation is met by Gruber. Regarding claim 19, while the preferred material of manufacture in Gruber is metal and

the metals listed in column 13, lines 3-14 have a higher conductivity than silicon, which is approximately 120 W/mK and can be looked up in standard handbooks, so claim 19 is met by Gruber. Metals, such as copper explicitly disclosed in Gruber, have an extremely high conductivity.

In response to applicant's November 9, 2010 remarks, the examiner's explanation, above, of how the fingers of Gruber branch out in a plurality of directions from the at least one inlet port/channel of Gruber is incorporated here by reference.

Applicant's arguments with respect to Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich all echo the arguments made with respect to Gruber and do not traverse that which Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich were relied upon to teach. Accordingly, applicant is deemed to have conceded that Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich are properly relied upon by the examiner for what they have been relied by the examiner to teach.

Claims 1, 8, 10, 12, 13, 14, 17, 19, 29, 30, 31, 32, 38, 40, 128-130 and 132 are rejected under 35 U.S.C. 103(a) as obvious over Gruber et al (USP 5,388,635) in view of the Jiang et al article "Thermal-Hydraulic performance of small scale micro-channel and porous-media heat exchangers" and Chu et al (USP 3,993,123) or Frey et al (USP 5,978,220).

The rejection immediately above is incorporated here by reference. To have made the axis of the cylindrical ports/channels 28 and 46 shown in Figures 8A and 8B of Gruber face outwardly in a direction parallel to the cooling surface of the heat exchange layer as taught by Chu would have been obvious to one of ordinary skill in the art to advantageously facilitate connection between cold plates.

Similarly, to have made the axis of the longitudinal cylindrical ports/channels 28 and 46 shown in Figures 8A and 8B of Gruber face outwardly in a direction parallel to the cooling surface of the heat exchange layer would have been obvious to one of ordinary skill in the art to advantageously facilitate connection between cold plates, as taught by Frey at 5 and 6.

Claims 1, 8, 10, 12, 13, 14, 16, 17, 19, 29, 30, 31, 32, 38, 40, 128-130 and 132 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gruber in view of O'Neill et al (USP 4,896,719) and Tonkovich (USP 6,680,044).

Gruber, assigned to IBM, shows in Figures 3, 4, 8A and 8B a system for cooling a heat source. An inlet port (analogous to port 108 in applicant's Figure 3b) is shown in Figure 8A at the very top of a cylindrical inlet channel that extends downwardly in Figure 8A. Collectively, the aforementioned inlet port and cylindrical channel below it are designated by reference numeral 28 in Gruber. The cylindrical inlet channel directs fluid from the aforementioned inlet port to a first of one or more fingers (the portion of duct

segments 30 that extend radially from inlet port/channel 28) that, in turn, feed fluid to a second of one of more fingers (the portion of duct segments 30 that are connected to and feed fluid to each of the supply channels 32).

These first and second one or more fingers feed fluid to channels 32 that, in turn, feed fluid to an intermediate plate 16 that has a plurality of holes extending therethrough. A heat exchanger layer 14 includes micro-fins 56 defining micro-grooves 58 between them similar to applicant's Figure 3A-3B species. As explained by Gruber, the heat exchanger layer 14 can also be "fin-less". See col. 8, line 34-43, incorporated here by reference. If the heat exchanger layer 14 is "fin-less" Gruber states that it may have "a texture or structures to promote fluid stirring and heat transfer". Gruber discusses hot spots in col. 15, lines 1-41, incorporated here by reference.

To have replaced the microchannel layer 14 of Gruber with the corresponding porous layer construction of O'Neill (i.e. skin 15 and adjoining expanded foam 25) would have been obvious to one of ordinary skill in the art to advantageously obtain extremely even cooling without any temperature gradients as would occur when there were discrete heat transfer zones as is the case in Gruber. Note that porous microstructures have better heat transfer characteristics than microchannels as evidenced by Jiang et al article "Thermal-Hydraulic performance of small scale micro-channel and porous-media heat exchangers." Here the Jaing article is only relied upon to show an inherent property of porous microstructures compared to microchannels.

As disclosed the porosity of the expanded foam should be such that heat exchange medium flows freely. With respect to claims 29-30 applicant has shown no criticality whatsoever and the art recognized tradeoff between getting adequate heat transfer and avoiding excessive pressure drop suggests that the variables being claimed are ultimately for the designer to select in any given heat transfer application. To have configured the porous intermediate layer of Gruber/O'Neill with a porosity that is known to provide good fluid flow as taught by Tonkovich in col. 2, lines 50-63, incorporated here by reference, would have been obvious to one of ordinary skill in the art to advantageously obtain extremely even cooling without any temperature gradients as would occur when there were discrete heat transfer zones as is the case in Gruber.

In response to applicant's November 9, 2010 remarks, the examiner's explanation, above, of how the fingers of Gruber branch out in a plurality of directions from the at least one inlet port/channel of Gruber is incorporated here by reference.

Applicant's arguments with respect to Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich all echo the arguments made with respect to Gruber and do not traverse that which Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich were relied upon to teach. Accordingly, applicant is deemed to have conceded that Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich are properly relied upon by the examiner for what they have been relied by the examiner to teach.

Claims 1, 8, 10, 12, 13, 14, 16, 17, 19, 29, 30, 31, 32, 38, 40, 128-130 and 132 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gruber in view of O'Neill et al (USP 4,896,719) and Tonkovich (USP 6,680,044) and Chu et al (USP 3,993,123) or Frey (USP 5,978,220).

The rejection immediately above is incorporated here by reference. To have made the axis of the cylindrical ports/channels 28 and 46 shown in Figures 8A and 8B of Gruber face outwardly in a direction parallel to the cooling surface of the heat exchange layer as taught by Chu would have been obvious to one of ordinary skill in the art to advantageously facilitate connection between cold plates.

Similarly, to have made the axis of the longitudinal cylindrical ports/channels 28 and 46 shown in Figures 8A and 8B of Gruber face outwardly in a direction parallel to the cooling surface of the heat exchange layer would have been obvious to one of ordinary skill in the art to advantageously facilitate connection between cold plates, as taught by Frey at 5 and 6.

Claims 41 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over any of the prior art references as applied to claim 1 above, and further in view of Cardella (USP 5,918,469) or WO 01/25711 A1 (cited by applicant).

Cardella teaches a thermoelectric cooler 24 between a heat source (an integrated circuit chip 22) and a liquid-coolant type heat exchanger 20. To have inserted a thermoelectric cooler between each of the integrated circuits of Gruber (in combination with the other prior art discussed above) and the bottom layer of Gruber (in combination with the other prior art discussed above) to advantageously cool the integrated circuits even more would have been obvious to one of ordinary skill in the art in view of Cardella. Alternatively, to have replaced heat exchanger 20 of Cardella with the microchannel heat sink assembly described in the above rejections to advantageously improve cooling in Cardella would have been obvious to one of ordinary skill in the art.

Finally, to have replaced either or both of the heat sink assemblies of WO 01/25711 A1 (cited by applicant) best seen in Figure 2 (18 and 19 at the bottom and 15 and 16 at the top) with the heat sink assembly of Gruber (in combination with the other prior art discussed above) would have been obvious to one of ordinary skill in the art to improve the cooling performance by advantageously reducing the length of the fluid flow paths.

In response to applicant's November 9, 2010 remarks, the examiner's explanation, above, of how the fingers of Gruber branch out in a plurality of directions from the at least one inlet port/channel of Gruber is incorporated here by reference.

Applicant's arguments with respect to Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich all echo the arguments made with respect to Gruber and do not traverse that which Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich were relied upon to teach. Accordingly, applicant is deemed to have conceded that Andersen, Hou, Messina, Jaing, ONeill, and Tonkovich are properly relied upon by the examiner for what they have been relied by the examiner to teach.

Claim 132 is rejected under 35 U.S.C. 103(a) as being unpatentable over any of the prior art as applied to claim 1 above, and further in view of Flint et al (USP 4,759,403).

To have made the inlet port of Gruber, inlet channel of Gruber, first of one or more fingers of Gruber, the second of one or more fingers of Gruber, or both of Gruber lie in a common plane would have been obvious from the teaching available to one of ordinary skill in the art from Figures 6 and 9 of Flint et al (USP 4,759,403), which teach an inlet port (at the right side of inlet channel 120), an inlet channel (120), a first of one or more fingers (the first one or more fingers that connect the left side of inlet channel 120 to each of the second of one or more fingers 88), the second of one or more fingers (88) or both that lie in a common plane. Such a modification would advantageously simplify fabrication of the cover.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John K. Ford whose telephone number is 571-272-4911. The examiner can normally be reached on Mon.-Fri. 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frantz Jules can be reached on 571-272-4834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/John K. Ford/
Primary Examiner, Art Unit 3784